Table 3

Sample		Material composition (mass %)										Sintering condition	HIP condition	Porosity	Electric resistance	Three point bending strength	Fracture toughness	Rolling fatigue life
		Si_3N_4	Electro-conductivity rendering agent			Rare earth element oxide		Al_2O_3	AlN	Other component		temperature × time × pressure	temperature × time × pressure					
			SiC	Other component								(℃) × (hr) × (MPa)	(℃) × (hr) × (MPa)	(%)	(Ω·cm)	(MPa)	(MPa·$m^{1/2}$)	(cycle)
Example	2	65	12	Mo_2C	12	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	9×10^6	1020	6.5	$>1 \times 10^7$
	3	59	20	Mo_2C	10	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	4×10^4	1040	6.3	$>1 \times 10^7$
	4	58	28	Mo_2C	3	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	2×10^5	1020	6.1	$>1 \times 10^7$
	5	55	19	Mo_2C	15	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	1×10^4	960	6.1	$>1 \times 10^7$
	6	75	17	Mo_2C	4	Y_2O_3	2	2	—	—	—	1850 × 4 × 0.9	1700 × 1 × 98	Up to 0.01	1×10^7	950	6.2	$>1 \times 10^7$
	7	63	16	Mo_2C	8	Y_2O_3	10	2	1	—	—	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	1×10^8	1000	6.5	$>1 \times 10^7$
	8	62	16	Mo_2C	8	Y_2O_3	4	5	4	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	Up to 0.01	9×10^5	1050	6.4	$>1 \times 10^7$
	9	64	16	Mo_2C	10	Y_2O_3	4	3	2	TiO_2	1	1850 × 4 × 0.9	———	0.2	2×10^5	980	6.6	$>1 \times 10^7$
	10	63	20	Mo_2C	3	Y_2O_3	4	3	2	TiO_2	5	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	3×10^6	1040	6.1	$>1 \times 10^7$
	11	58	20	Mo_2C	10	Y_2O_3	4	3	3	ZrO_2	2	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	5×10^4	1070	6.4	$>1 \times 10^7$
	12	58	20	Mo_2C	10	Y_2O_3	4	3	3	HfO_2	2	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	4×10^4	1080	6.4	$>1 \times 10^7$
	13	64	16	$MoSi_2$	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	9×10^4	1080	6.6	$>1 \times 10^7$
	14	64	16	WC	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	5×10^5	1050	6.4	$>1 \times 10^7$
	15	64	16	TaC	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	3×10^5	1100	6.6	$>1 \times 10^7$
	16	64	16	NbC	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	9×10^4	1120	6.7	$>1 \times 10^7$
	17	61	16	Mo_2C	10	Er_2O_3	7	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	1×10^6	1100	6.7	$>1 \times 10^7$
	18	63	16	Mo_2C	10	CeO_2	5	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	1×10^5	1010	6.6	$>1 \times 10^7$
	19	63	16	Mo_2C	10	Nd_2O_3	5	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	2×10^5	1080	6.5	$>1 \times 10^7$
	20	61	16	Mo_2C	10	Dy_2O_3	7	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	Up to 0.01	1×10^5	1100	6.6	$>1 \times 10^7$
Comparative example	4	71	10	Mo_2C	8	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	1×10^8	1100	6.8	$>1 \times 10^7$
	5	53	30	Mo_2C	6	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	1×10^4	920	5.8	8×10^6
	6	70	17	Mo_2C	2	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	2×10^8	1070	6.7	$>1 \times 10^7$
	7	53	19	Mo_2C	17	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	0.05	8×10^3	890	5.9	8×10^6
	8	66	16	Mo_2C	10	Y_2O_3	1	3	3	TiO_2	1	1850 × 4 × 0.9	1700 × 1 × 98	0.1	4×10^5	870	5.7	7×10^6
	9	55	16	Mo_2C	10	Y_2O_3	12	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	2×10^5	900	5.9	8×10^6
	10	61	20	Mo_2C	3	Y_2O_3	4	3	2	TiO_2	7	1800 × 4 × 0.7	1700 × 1 × 98	Up to 0.01	2×10^6	890	6.0	9×10^6

Table 4

Sample		Material composition (mass %)										Sintering condition	HIP condition	Crushing strength	Rolling fatigue life	Defects by static electricity
		Si_3N_4	Electro-conductivity rendering agent			Rare earth element oxide		Al_2O_3	AlN	Other component		temperature × time × pressure (℃) × (hr) × (MPa)	temperature × time × pressure (℃) × (hr) × (MPa)	(MPa)	(hr)	
			SiC	Other component												
Example	2B	65	12	Mo_2C	12	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	240	> 400	No defect
	3B	59	20	Mo_2C	10	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	250	> 400	No defect
	4B	58	28	Mo_2C	3	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	230	> 400	No defect
	5B	55	19	Mo_2C	15	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	260	> 400	No defect
	6B	75	17	Mo_2C	4	Y_2O_3	2	2	—	—	—	1850 × 4 × 0.9	1700 × 1 × 98	210	> 400	No defect
	7B	63	16	Mo_2C	8	Y_2O_3	10	2	1	—	—	1800 × 4 × 0.7	1700 × 1 × 98	220	> 400	No defect
	8B	62	16	Mo_2C	8	Y_2O_3	4	5	4	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	255	> 400	No defect
	9B	64	16	Mo_2C	10	Y_2O_3	4	3	2	TiO_2	1	1850 × 4 × 0.9	———	230	> 400	No defect
	10B	63	20	Mo_2C	3	Y_2O_3	4	3	2	TiO_2	5	1800 × 4 × 0.7	1700 × 1 × 98	240	> 400	No defect
	11B	58	20	Mo_2C	10	Y_2O_3	4	3	3	ZrO_2	2	1800 × 4 × 0.7	1700 × 1 × 98	250	> 400	No defect
	12B	58	20	Mo_2C	10	Y_2O_3	4	3	3	HfO_2	2	1800 × 4 × 0.7	1700 × 1 × 98	255	> 400	No defect
	13B	64	16	$MoSi_2$	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	250	> 400	No defect
	14B	64	16	WC	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	240	> 400	No defect
	15B	64	16	TaC	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	250	> 400	No defect
	16B	64	16	NbC	10	Y_2O_3	4	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	270	> 400	No defect
	17B	61	16	Mo_2C	10	Er_2O_3	7	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	260	> 400	No defect
	18B	63	16	Mo_2C	10	CeO_2	5	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	230	> 400	No defect
	19B	63	16	Mo_2C	10	Nd_2O_3	5	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	240	> 400	No defect
	20B	61	16	Mo_2C	10	Dy_2O_3	7	3	2	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 30	250	> 400	No defect
Comparative example	4B	71	10	Mo_2C	8	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	250	> 400	Defects
	5B	53	30	Mo_2C	6	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	190	355	No defect
	6B	70	17	Mo_2C	2	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	230	> 400	Defects
	7B	53	19	Mo_2C	17	Y_2O_3	4	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	185	330	No defect
	8B	66	16	Mo_2C	10	Y_2O_3	1	3	3	TiO_2	1	1850 × 4 × 0.9	1700 × 1 × 98	180	345	No defect
	9B	55	16	Mo_2C	10	Y_2O_3	12	3	3	TiO_2	1	1800 × 4 × 0.7	1700 × 1 × 98	200	360	No defect
	10B	61	20	Mo_2C	3	Y_2O_3	4	3	2	TiO_2	7	1800 × 4 × 0.7	1700 × 1 × 98	190	370	No defect